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Involvement of Polymorphisms of the Interleukin 17A (rs2275913) and 17F (rs763780) Genes in the Development of Cervical Cancer and HPV Infection in Two West African Countries

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Abstract

Background: Interleukin-17 (IL-17) is a pro-inflammatory cytokine associated with inflammation, autoimmune disorders, and even tumors. Several studies have revealed abnormally high expression of IL-17 in human malignant tumors. The main objective of this study was to analyze the association between Single Nucleotide Polymorphisms (SNPs) of IL-17A (rs 2275913) and IL-17F (rs 763780) and their involvement in the development of cervical cancer in Burkina Faso and Togo, as well as their association with HPV. **Methodology**: In the present study, two SNPs in IL-17A (rs 2275913) and IL-17F (rs 763780) were analyzed in 44 patients with Cervical Cancer (CC) and 93 women with no history of cervical cancer from the city of Ouagadougou and 114 women with no history of cervical cancer from the city of Kara. Nucleic acids were extracted using the R-Biopharm kit. Polymorphism genotyping was performed by real-time PCR using TaqMan® tests. **Results**: Our results indicated that the G and A alleles were not associated with the different characteristics studied in the two cities. The frequency of genotypes of the rs2275913 polymorphism

of the 1L-17A gene was 91.4%, 7.5%, and 1.1% for the GG, GA, and AA genotypes in Ouagadougou, 91.23%, 7.90%, and 3.23% for the TT, TC, and CC genotypes in Ouagadougou, and 89.50%, 10.50% and 0.00% respectively in Lomé in the city of Kara. The mutation rates of rs 2275913 and rs 763780 polymorphisms were 4.84% and 12.90% respectively for Ouagadougou, compared to 4.83% and 5.26% for Kara. There was no statistically significant difference between the genotypes of IL-17A (rs 2275913) and IL-17F (rs763780) polymorphisms in cervical cancer cases, and controls in Ouagadougou. Certain characteristics such as age at first sexual intercourse and parity were associated with IL-17A (rs 2275913) genotypes in Ouagadougou and age at first sexual intercourse in Kara. **Conclusion**: The results indicate that IL-17A and IL-17F polymorphisms are influenced by certain characteristics of women, but are not involved in the development of cervical cancer.

Keywords

Cervical Cancer, HPV, IL-17, Polymorphisms, Burkina Faso, Togo

1. Introduction

Cervical cancer is a common malignant tumor worldwide, with nearly 660,000 new cases and 350,000 deaths in 2022. Approximately 90% of cases occur in developing countries [1]. Cervical cancer, the second most common cancer among women worldwide, is one of the leading causes of cancer death [1], with Human Papillomavirus (HPV) infections identified as the main risk factor in its development [2]. The progression of HPV infection in the host can be multifactorial, including infection with the HPV type with the highest oncogenic risk [3]. Sociodemographic factors and the state of the host's immune system, including genetic polymorphisms, play a role in the immune response [3] [4]. Numerous studies have reported that polymorphisms in a series of genes, including those of interleukin-17 (IL-17), are associated with susceptibility to cervical cancer [5] [6]. IL-17 is a pro-inflammatory cytokine secreted by various cells, including T helper cells, CD8+ T cells, CD4+ T cells, and natural killer cells in the tumor microenvironment [7]. This cytokine is involved in multiple functions, including host defense and the pathology of autoimmune diseases, infectious diseases, chronic inflammatory diseases, and cancers [7]. IL-17-producing cells may play a role in antitumor immunity. IL-17 is a family of cytokines composed of six members (IL-17A to IL-17F) and five receptors (IL-17RA to IL-17RD and SEF) [8]. Among the IL-17 genes, the best known are IL-17A (rs2275913) and IL-17F (rs7637780), which share the greatest homology between them and encode two common receptors: IL-17RA and IL-17RC [9]. More recent meta-analyses tend to confirm that these polymorphisms are significant risk factors for several cancers [10]. These cells and their cytokines have been implicated in both pro-tumor and anti-

tumor processes. They can also promote and exacerbate diseases caused by viruses, as they induce inflammation that affects the microenvironment around tumors, which involves the proliferation, migration, and survival of cancer cells [5]. Although previous studies have evaluated the correlation between the rs3748067 polymorphism of the IL-17A gene and susceptibility to breast and cervical cancer [11] [12], the results were inconsistent [5] [13]. Furthermore, no studies have been conducted among Burkinabe patients with cervical cancer to evaluate the association with Interleukin-17 polymorphism. The main objective of this study was to analyze the association between IL-17A (rs 2275913) and IL-17F (rs 763780) SNPs and their involvement in the development of cervical cancer in Burkina Faso, as well as their association with HPV in Togo.

2. Methodology

2.1. Subjects

This is a case-control study conducted from October 2020 to March 2021. The study population in the city of Ouagadougou consisted of 137 sexually active women, including 44 cases of cervical cancer and 93 without a history of cervical cancer. The study population in the city of Kara consisted of 114 sexually active women with no history of cervical cancer. These two populations from two neighboring West African countries have a similarity in HPV genotype mapping. These samples had already been genotyped for HPV [14] [15].

2.2. Nucleic Acid Extraction

Human DNA was extracted using the "R-Biopharm" kit, which allows simultaneous extraction of DNA and RNA, in accordance with the protocols provided by the manufacturers. The nucleic acid extracts obtained were stored at −80˚C for later use.

2.3. TaqMan Probe Real-Time PCR

Genotyping of the two IL-17 polymorphisms was performed using TaqMan SNP (Applied Biosystems, ABI, Foster City, CA, USA). We used an optimized protocol employed by Yi Quan *et al.* [5]. For IL-17A rs2275913 genotyping, real-time PCR was performed in a total volume of 10 µL reaction mixture containing 2.5 µL TaqMan (2X) Universal PCR Master Mix, 1 µL of SNP Genotyping Assay (2X), 1.5 µL of sterile DNase-free water, and 5 µL (10 ng) of genomic DNA. The thermal conditions for real-time PCR were 95˚C for 10 min, followed by 49 cycles of 95˚C for 15 s and 60˚C for 1 min. For IL-17F rs763780, real-time PCR with TaqMan probe was performed in a total volume of 10 µL reaction mixture containing 2.5 µL TaqMan PCR Universal Master Mix (2X), 1 µL of SNP genotyping assay (2X), 1.5 µL of sterile DNase-free water, and 5 µL (10 ng) of genomic DNA. The thermal conditions for real-time PCR were 95˚C for 10 minutes, followed by 59 cycles at 95˚C for 15 seconds and 60˚C for 1 minute.

2.4. Data Analysis

Allele discrimination, allele frequency, and genotype calculations were performed using TaqMan Genotyper® 1.6.0 software. 34. Data were analyzed using Statistical Package for Social Sciences (SPSS) 26.0 and Epi Info version 7.2 software. The chi-square test was used to compare frequencies. Odd ratios and 95% confidence intervals were calculated to assess risk. Results are considered statistically significant for $p < 0.05$.

3. Results

3.1. Sociodemographic Characteristics According to HPV Infection in Ouagadougou

Table 1 presents the socio-demographic, behavioral, and sexual characteristics of the 93 sexually active women in Ouagadougou with no history of cervical cancer, according to their HPV status. None of the women smoked. The average age of the participants was 33.91 ± 8.52 years, with ages ranging from 18 to 57 years. There were fewer university graduates and more married women. HPV status was positive in 51 (54.8%) women and negative in 42 (45.2%) women. The number of abortions was statistically associated with infection in Ouagadougou (p-value = 0.007).

Table 1. Sociodemographic, behavioral, and sexual characteristics according to HPV infection among women in Ouagadougou.

Behavioral and sexual characteristics	Frequency	HPV		p-value
		HPV⁻ (n)	HPV⁺ (n)	
Age				
Under 20 years old	1	1	0	0.37
20 - 39	70	30	40	
40 - 60	22	11	11	
Age at first sexual intercourse				
Under 20 years old	62	32	30	0.06
Over 20 years	31	10	21	
Marital status				
Singles	13	4	9	0.30
Brides	78	36	42	
Widows	2	2	0	
Contraceptive usage				
Yes	35	17	21	0.94
No	58	25	30	

Continued

Gestation				
1 - 5	72	34	45	0.41
More than 5	21	08	06	
Parity				
0 - 5	80	39	46	0.43
More than 5	13	3	5	
Number of abortions				
0	64	21	21	0.007
1 - 3	29	43	08	
Level of education				
Illiterate	27	14	13	
Primary school	25	12	13	0.63
Secondary school	28	12	16	
University	13	4	9	

3.2. Sociodemographic Characteristics According to HPV Infection in Kara

Table 2 presents the socio-demographic, behavioral, and sexual characteristics of the 114 participants from the city of Kara according to their HPV status. As in the city of Ouagadougou, none of the women smoked. The average age of the participants was 33.87 ± 9.58 years, with ages ranging from 17 to 61 years. There were fewer university graduates and more married women. The HPV status was 64 (56.14%) women positive for HPV and 42 (43.86%) women negative for HPV. The age of first sexual intercourse was statistically associated with HPV infection in Kara.

Table 2. Sociodemographic, behavioral, and sexual characteristics according to HPV infection in women in Kara.

Behavioral and sexual characteristics	Frequency	HPV		Total	p-value
		HPV⁻ N (%)	HPV⁺ N (%)		
Age					
Under 20 years old	3	3	0		
20 - 39	81	40	41	114	0.19
40 - 60	26	6	20		
Over 60 years old	4	1	3		

Continued

Age at first sexual intercourse					
Under 20 years old	77	30	47	114	0.048
Over 20 years	37	20	17		
Marital status					
Singles	27	8	19	114	0.08
Brides	80	41	39		
Widows	7	1	6		
Contraceptive usage					
Yes	91	38	53	114	0.25
No	23	12	11		
Gestation					
1 - 5	104	44	60	114	0.08
More than 5	10	6	4		
Parity					
0 - 5	109	46	63	114	0.16
More than 5	5	4	1		
Number of abortions					
0	71	28	43	114	0.44
1 - 3	43	22	21		
Level of education					
Illiterate	17	10	7	114	0.33
Primary school	30	14	16		
Secondary school	44	19	25		
University	23	7	16		

3.3. Distribution of IL-17A Gene Polymorphisms (rs 2275913) According to Socio-Demographic and Sexual Characteristics in Ouagadougou and Kara

Table 3 shows the distribution of IL-17A gene polymorphisms (rs 2275913) in the two cities. Certain characteristics, such as age at first sexual intercourse and parity, were associated with IL-17A (rs 2275913) genotypes in Ouagadougou, and age at first sexual intercourse in Kara. Alleles G and A were not associated with the various characteristics studied in either city.

3.4. Distribution of Polymorphisms of 1L-17F (rs 763780) and 1L-17A (rs 2275913) Genes in Ouagadougou and Kara

The frequency of genotypes of the rs2275913 polymorphism of the 1L-17A gene was 91.4%, 7.5%, and 1.1% in Ouagadougou, and 91.23%, 7.90%, and 3.23% in Kara, respectively, for the GG, GA, and AA genotypes. Similarly, the frequency of

Table 3. Distribution of polymorphisms of the 1L-17A gene (rs 2275913) in Ouagadougou and Kara.

Characteristics		Genotypes			p-value	Allele		p-value
		GG	AG	AA		G	A	
1L-17A (rs 2275913)-Ouagadougou								
Age	Under 40 years old	66	5	0	0.4	137	5	0.13
	More than 40 years	19	2	1		40	4	
HPV status	Positive	48	3	0	0.42	99	3	0.18
	Negative	37	4	1		78	6	
Age at first sexual intercourse	Under 20 years old	55	5	1	0.005	115	7	0.45
	More than 20 years old	29	2	0		60	2	
Gestation	0 - 4	66	5	1	0.042	137	7	0.97
	More than 4	19	2	0		40	2	
Parity	0 - 4	73	5	1	0.07	151	7	0.47
	More than 4	11	2	0		24	2	
1L-17A (rs 2275913)-Kara								
Age	0 - 39 years old	77	6	1	0.98	160	8	0.94
	More than 40 years old	27	3	0		57	3	
HPV Status	Positive	58	6	0	0.42	122	6	0.93
	Negative	47	3	1		97	5	
Age at first sexual intercourse	0 - 19 years old	70	7	0	**0.016**	147	7	0.77
	More than 20	34	2	1		70	4	
Gestation	0 - 4	82	8	1	0.98	172	10	0.34
	More than 4	22	1	0		45	1	
Parity	0 - 4	91	8	1	0.92	190	10	0.74
	More than 4	13	1	0		27	1	

genotypes of the rs763780 polymorphism of the 1L-17F gene was 74.42%, 19.35% and 3.23% in Ouagadougou and 89.50%, 10.50% and 0.00% in Kara, respectively for the TT, TC and CC genotypes.

The mutation rates of rs 2275913 and rs 763780 polymorphisms were 4.84% and 12.90% for Ouagadougou, respectively, compared to 4.83% and 5.26% for Kara (Table 4).

3.5. Comparison of Polymorphisms of 1L-17A (rs 2275913) and 1L-17F (rs763780) between CC and Controls in Ouagadougou

Table 5 compares the polymorphisms of 1L-17A (rs 2275913) and 1L-17F (rs763780) between CC patients and controls with no history of CC in Ouagadougou. There is no statistically significant difference between the genotypes of the polymorphisms of 1L-17A (rs 2275913) and 1L-17F (rs763780), cases of cervical cancer, and controls in Ouagadougou in this study.

Table 4. Distribution of polymorphisms of genes 1L-17F (rs 763780) and 1L-17A (rs 2275913) in Ouagadougou and Kara.

Genotypes		Effective	Frequency (%)	Alleles	Frequency (%)
Ouagadougou					
1L-17A (rs 2275913)	GG	85	91.4	G	95.16
	GA	7	7.5		
	AA	1	1.1	A	4.84
	Total	93	100		
HWE (p-value)			0.79		
1L-17F (rs 763780)	TT	72	74.42	T	87.10
	TC	18	19.35		
	CC	3	3.23	C	12.9
	Total	93	100		
HWE (p-value)			0.73		
Kara					
1L-17A (rs 2275913)	GG	104	91.23	G	95.17
	GA	9	7.90		
	AA	1	0.87	A	4.83
	Total	114	100		
HWE (p-value)			0.81		
1L-17F (rs 763780)	TT	102	89.5	T	94.74
	TC	12	10.5		
	CC	00	00	C	5.26
	Total	114	100		
HWE (p-value)			1		

Table 5. Comparison of polymorphisms of 1L-17A (rs 2275913) and 1L-17F (rs763780) between CC and controls in Ouagadougou.

Genotypes/ Allele	Cervical cancer (%) N = 44	Control (%) N = 93	P-value	OR (IC 95%)
rs 2275913				
GG	37 (84.10)	85 (91.40)	Ref.	---
GA	7 (15.90)	7 (7.52)	0.13	2.29 (0.7 - 7.0)
AA	0 (00)	1 (1.08)	NA	NA
GA/AA	7 (15.90)	8 (8.60)	0.07	2.62 (0.8 - 7.7)
Allele				
G	81 (92.04)	177 (95.16)	Ref.	
A	7 (8.96)	9 (4.84)	0.30	0.58 (0.2 - 1.6)

Continued

rs 763780				
TT	34 (77.27)	72 (77.42)	Ref.	
TC	7 (15.91)	18 (19.35)	0.69	1.21 (0.4 - 3.1)
CC	3 (6.82)	3 (3.23)	0.36	0.47 (0.09 - 2.46)
CT/CC	10 (22.73)	21 (22.58)	0.98	0.99 (0.4 - 2.3)
Allele				
T	75 (85.23)	162 (87.10)	**Ref.**	
C	13 (14.77)	24 (12.90)	0.67	0.85 (0.4 - 1.7)

3.6. Distribution of Polymorphisms of the 1L-17F Gene (rs763780) According to Characteristics in Ouagadougou and Kara

In the city of Kara, IL-17F (rs763780) genotypes are influenced by characteristics such as gestation and number of abortions. Gestation was associated with the allele type of the IL-17F (rs763780) gene in Ouagadougou. Multi-infection with high-risk oncogenic HPV genotypes, HPV status, and HPV 30S were correlated with IL-17F (rs763780) polymorphism genotypes in Kara. In addition, HPV status significantly affected IL-17F (rs763780) alleles in Kara (Table 6).

Table 6. Distribution of IL-17F gene polymorphisms (rs763780) according to characteristics in Ouagadougou and Kara.

Characteristics		Genotypes			p-value	Allele		p-value
		TT	TC	CC		T	C	
IL-17F (rs763780)—Ouagadougou								
Age	Under 40 years old	55	13	3	0.13	123	19	0.72
	More than 40 years old	17	5	0		39	5	
HPV Status	Positive	37	13	1	0.21	87	15	0.42
	Negative	35	5	2		75	9	
Age of first sexual intercourse	Under 20 years old	46	14	1	0.6	106	16	0.96
	More than 20 years old	25	4	2		54	8	
Gestation	0 - 4	58	12	2	0.001	128	14	0.02
	More than 4	14	6	1		34	10	
Parity	0 - 4	64	13	2	0.10	141	17	0.07
	More than 4	8	4	1		20	6	
Number of abortions	Yes	50	12	2	0.05	112	16	0.5
	No	22	6	1		30	8	
IL-17F (rs763780)—Kara								
HPV Genotypes	Multi-infection	13	4	0	0.022	30	4	0.31
	Single-infection	41	6	0		88	6	

Continued

HPV Status	Positive	54	10	0	0.041	118	10	0.047
	Negative	49	2	0		100	2	
HPV 30S	Yes	13	5	0	0.009	31	5	0.11
	No	41	5	0		87	5	
Gestation	0 - 4	79	12	0	0.55	170	12	0.07
	More than 4	23	0	0		46	0	
Parity	0 - 4	88	12	0	0.31	188	12	0.18
	More than 4	14	0	0		28	00	

3.7. Genotypes and Alleles Frequencies According to the HPV Status in Kara

Table 7 shows the genotype and allele frequencies of the two polymorphisms rs 2275913 and rs763780 in sexually active women in the city of Kara according to HPV status. The rs763780 genotypes were associated with HPV status. The C allele and CT/CC genotypes were favorable to infection with high-risk oncogenic HPV.

Table 7. Genotypic and allelic frequency of rs 2275913 and rs763780 according to HPV status in Kara.

Genotypes/ Allele	HPV^+ (%) N = 64	HPV^- (%) N = 51	P-value	OR (IC 95%)
		rs 2275913		
GG	58 (84.10)	47 (91.40)	**Ref.**	**Ref.**
GA	6 (15.90)	3 (7.52)	0,5	0.60 (0.1 - 2.5)
AA	0 (00)	1 (1.08)	NA	NA
GA/AA	6 (15.90)	4 (8.60)	0.77	0.82 (0.2 - 3.0)
		Allele		
G	122 (95.31)	97 (95.10)	**Ref.**	**Ref.**
A	6 (4.69)	5 (4.90)	0.93	1.04 (0.3 - 3.5)
		rs763780		
TT	54 (84.37)	49 (96.08)	**Ref.**	**Ref.**
TC	10 (15.63)	2 (3.92)	0.041	0.22 (0.04 - 1.05)
CC	0 (00)	0 (3.23)	NA	NA
CT/CC	10 (15.63)	2 (3.92)	0.041	0.22 (0.04 - 1.05)
		Allele		
T	118 (92.19)	100 (98.04)	**Ref.**	**Ref.**
C	10 (7.81)	2 (1.96)	0.047	0.23 (0.05 - 1.10)

Ref = reference.

4. Discussion

Cancer is a major global public health issue. In recent years, genetic susceptibility to cancer has attracted increasing attention in the study of genetic polymorphisms in tumorigenesis [16]. The association between inflammation and cytokines plays a key role in the transformation of the epithelium of a precancerous lesion into cervical cancer. Chronic inflammation is a necessary step in maintaining and promoting cancer progression, such as tumor tissue reconstruction, angiogenesis, metastasis, and suppression of the innate anti-cancer immune response [17]. Genetic and epigenetic mutations associated with HPV infection could trigger and maintain cell transformation and autonomous proliferation of transformed cervical cells, leading to cancerous proliferation. Numerous studies conducted in Burkina Faso have shown a high prevalence of HR-HPV likely to progress to cancer, and most of the genotypes found are not covered by the available vaccines [18]-[28]. Furthermore, susceptibility to HPV could be affected by polymorphisms in genes involved in the immune response, which could prevent the progression of cervical lesions, particularly NK cells.

The main objective of this case-control study was to analyze the association between IL-17A (rs 2275913) and IL-17F (rs 763780) SNPs and their involvement in the development of cervical cancer in Burkina Faso, as well as their association with HPV infection in Togo. The results reveal that certain behavioral characteristics of women are involved in the manifestation of IL-17A (rs 2275913) and IL-17F (rs 763780) polymorphisms and HPV infection. Indeed, the age of first sexual intercourse was statistically associated with HPV infection in Kara. This result confirms the study in Burkina Faso, which found a statistically significant association between age at first sexual intercourse and HPV infection [29]. As HPV is mainly transmitted through sexual intercourse, it is important to be aware that early sexual intercourse can be a risk factor for HPV infection [30]. Studies have suggested age as a risk factor for HPV infection, but the age of first sexual intercourse remains a risk factor to be confirmed [26]. Certain characteristics, such as age at first sexual intercourse and pregnancy, were associated with IL-17A genotypes (rs 2275913) in Ouagadougou and age at first sexual intercourse in Kara. Gestation was associated with the allele type of the IL-17F gene (rs 763780) in Ouagadougou. These characteristics are much more strongly associated with HPV infection in Burkina Faso. Unfortunately, several studies on IL-17 in patients with cervical cancer have not reported an association between IL-17 polymorphisms and characteristics such as age at first sexual intercourse, parity, and number of births [13] [31] [32]. Nevertheless, our results corroborate those of Cong *et al.*, who also found an association between age and primiparity [16]. These results provide a probable indication of the long-term involvement of IL-17 polymorphisms in the progression of cervical cancer.

The G and A alleles were not associated with the various characteristics studied in the two cities. The frequency of genotypes of the rs 2275913 polymorphism of the IL-17A gene was 91.4%, 7.5%, and 1.1% for the GG, GA, and AA genotypes in

Ouagadougou, and 91.23%, 7.90%, and 3.23% in Kara, respectively. Similarly, the frequency of genotypes of the rs 763780 polymorphism of the IL-17F gene was 74.42%, 19.35% and 3.23% for the TT, TC and CC genotypes in Ouagadougou and 89.50%, 10.50% and 0.00% respectively in Kara. There was an almost homogeneous distribution of the two IL-17 polymorphisms studied in Ouagadougou and Kara. Elsissy *et al.* found in a case-control study of an Egyptian population with acute myeloid leukemia proportions of 64%, 22.5% and 13.5% for the TT, TC and CC genotypes for IL-17F respectively, and 30.5%, 16.5%, and 53% for the AA, AG, and GG genotypes of IL-17A, respectively [33]. Although the authors indicated an association between IL-17A and IL-17F polymorphisms and acute myeloid leukemia, these results once again highlight the genetic diversity in Africa. In addition, Quan *et al.* reported that in a Chinese population with cervical cancer, they found frequencies of 17.3%, 46.4%, and 36.3% for the AA, AG, and GG genotypes of IL-17A, respectively, and 71.4%, 27.3% and 1.3% for the TT, TC and CC genotypes for IL-17F, respectively [5]. The mutation rates for polymorphisms rs 2275913 and rs 763780 were 4.84% and 12. 90% for Ouagadougou, compared to 4.83% and 5.26% for Kara. These mutation rates, which are almost identical in Burkina Faso and Togo, differ from the results of Quan *et al.* The ethnic mixing, lifestyle, and almost identical climate of the two countries could explain these results.

In our study, there was no statistically significant difference between the genotypes of IL-17A (rs 2275913) and IL-17F (rs 763780) polymorphisms, cervical cancer cases, and controls in Ouagadougou. Quan *et al.* reported the same results for IL-17F (rs 763780). However, they found a statistically significant association for IL-17A (rs 2275913). Dai *et al.* found the same results as Quan *et al.* in a population with cervical cancer [34]. This difference with our results could be explained by the size of our samples and, above all, the number of cancer cases.

Multi-infection with high-risk oncogenic HPV genotypes, HPV status, and HPV 30S were correlated with IL-17F (rs 763780) polymorphism genotypes in Kara. These risk factors contribute significantly to the development of cervical cancer. In addition, HPV status significantly affected IL-17F (rs 763780) alleles in Kara. This variant might influence the immune response to HPV infection.

The rs 763780 genotypes were associated with HPV status, and the C allele and CT/CC genotypes were associated with persistent infection with high-risk oncogenic HPV. Persistent HPV infection is the main cause of cervical cancer. Lv *et al.* reported results that were partially similar to ours. They suggested that IL-17 was associated with high-risk HPV infection, particularly HPV 16 and HPV 18 [35].

5. Conclusion

The results of this study indicate that IL-17A and IL-17F polymorphisms are not associated with susceptibility to cervical cancer in our study population. The pathophysiological characteristics of cervical cancer are not affected by the polymorphisms. Certain patient characteristics have an influence on HPV infection and on IL-17A and IL-17F polymorphisms. It would be interesting to continue this

study, taking into account certain shortcomings such as the low number of cancer cases and the relatively small size of the study population. These results suggest future research directions for genetic susceptibility to cervical cancer in this population, given that these particular SNPs do not appear to be major risk factors.

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Author Contributions

This work was carried out in collaboration among all authors. All authors contributed equally to conception and design of this study. All authors read and approved the final manuscript.

Ethical Consideration

This study was approved by the National Health Research Ethics Committee of Burkina Faso under No. 2018-01-012.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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